CHAPTER 7
ENVIRONMENT

INTRODUCTION

Main sections of this Chapter:

A healthy and productive natural environment is essential to ensuring a sustainable local economy. Since individual activities can alter the community environment, for better or worse, environmental considerations are common evaluation criteria for public activities. The integrity, reasoning, and understanding that we bring, as a community or as individuals, to the work of community-building will test whether we can, in the words of writer Wallace Stegner, "create a society to match our scenery."

This chapter focuses on the natural environment, which is defined as the physical conditions of a given area, including, but not limited to, land, topography, agriculture, open space, flora and fauna, sand and gravel resources, air quality, surface and ground water, wetlands and riparian areas, floodplains, noise, light, and climate. The local environment also includes attributes such as conservation, energy, waste, and land development in addition to development constraints such as the wildland-urban interface, floodplains, potential liquefaction during an earthquake, and earthquake faults. Environmental and energy issues for the Helena area are city-wide, affecting all age groups, abilities, and income levels. This Growth Policy emphasizes protection of environmentally sensitive areas by encouraging urban development where appropriate and with lower density or minimal development in areas with environmental constraints.

GENERAL OVERVIEW

Helena has a dry climate with approximately 11.6 inches of precipitation a year, which relates to drought, wildfire potential, and water supply. Climate projections indicate not only warming climate, but also smaller snow pack, earlier runoff, smaller volumes of water available within the watershed, lower mid-summer flows, and greater frequency and intensity of wildfires. (Source: Montana Climate Change Action Plan)

Since April 1880, Helena has been host to a National Weather Service (NWS) station. Based on the data collected by the NWS, overall annual average daily temperatures have been calculated and compared on a yearly basis. The annual average temperature in Helena is 43.9 □F, based upon 128 years of data. Of the 10 warmest years on record, four have occurred since 2000: 2001, 2003, 2006, and 2007. The warmest year on record is 2007 with an average daily temperature of 48.4 □F (McCahon, 2008). Likewise, extreme summer temperatures in Helena have increased over the last two decades (based on National Weather Service data compiled by DEQ), with the average number of days over 90 degrees doubling. Comparatively, the coolest years on record occurred sporadically between 1911 and 1996, with 1951 reported as the coolest year with an average daily temperature of 39.8 □F (McCahon, 2008). Stream flow records in Helena's primary water source, the Ten Mile watershed, echo the surprising changes in temperature.

Readings from the United States Geological Survey (USGS) Tenmile Creek gage station reveal that the average summer runoff for the past 8 years was 34 percent lower than the average runoff for the 85 previous years. Similar trends appear throughout Montana and the northern Rockies. US Temperature and Precipitation Trends show decadal average increases from 1976 forward (http://www.cpc.ncep.noaa.gov/trndtext.shtml). All of Montana is shown as getting warmer. The Montana Climate Office (http://climate.ntsg.umt.edu/) has Weather Station Trends 1951-2004 (http://climate.ntsg.umt.edu/mtclimate/multi-city_files/frame.htm) for Billings, Great Falls, Bozeman, Missoula and Kalispell, showing increasing average March temperatures and decreasing annual snowfall.

Source: 2009 Helena Climate Change Task Force Action Plan

In Helena, about half the year has clear or partly cloudy days, affecting the potential amount of solar gain for solar energy systems and energy use. Energy use, energy alternatives, water supply, drought and fire potential, and conservation are related to climate changes. Increased energy costs are reflected in transportation costs and electricity and heating prices affecting families, schools, businesses, and local and state government.

Maintaining a quality environment requires encouraging sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs into the indefinite future. It uses currently available technology, and also respects other species' need to survive and thrive. Sustainability has a "triple bottom line" of economic prosperity, environmental quality, and social equity.

The City of Helena works with a variety of regulatory agencies in the environmental arena to protect air and water quality, conserve energy and wildlife, and minimize weeds. The list includes the federal Environmental Protection Agency (EPA), Federal Emergency Management Administration (FEMA) and the Army Corps of Engineers; Montana Department of Environmental Quality (DEQ), Department of Natural Resources and Conservation (DNRC), and Fish, Wildlife and Parks (FWP); and Lewis and Clark County.

The City also currently has several environmental and development advisory committees such as the City-County Health Board, Consolidated Planning Board, Helena Zoning Commission, Helena Open Land Management Advisory Committee, Non-Motorized Travel Advisory Council, Parks Board, and the Water Quality District Board. Several local and statewide nonprofit environmental organizations also assist the City with their expertise and volunteers with recycling, tree-planting, weed management, energy conservation, etc.

LAND AND TOPOGRAPHY

Helena is situated on the southern edge of Lewis and Clark County, approximately mid-way between Glacier and Yellowstone Parks. The City sits on the southern end of the Helena Valley, which still contains agricultural uses. There are five lakes within a 30-minute drive, and Helena is surrounded by timbered mountain ranges that contain sites of former mining activity conducted during the late 1800s.

Much of the Helena valley floor was in agricultural use prior to residential and commercial development. Ten Mile Creek and Prickly Pear Creek cross the valley on their way to Lake Helena. Lands along these creeks contain riparian areas and 500-year flood plains. They may have high groundwater (less than 10 feet depth to groundwater) and have a higher susceptibility for liquefaction during an earthquake (see Development Constraints Map- electronic link or map at the end of this Chapter). Both creek areas provide mule deer habitat. Antelope live in the southeastern portion of the City adjacent to Jefferson County.

Residences extend south and southwest beyond the City limits to the Lewis and Clark/Jefferson county line. In some areas, approximately 1,000 feet separates the Helena city limit boundary from the Lewis and Clark/Jefferson County boundary. The city abuts forested hills to the south, providing an aesthetic backdrop with Mount Helena on the southwest and Mount Ascension on the south—both geographic and visually prominent landmarks. This area provides habitat for moose, elk, and mule deer. This area also includes federal land ownership (BLM and Forest Service) interspersed with private land.

The South Hills area has slopes of 15% to 30% with occasional pockets of 30% to 90% and carries a high to severe fire-risk rating (see Development Constraints Map- electronic link or map at the end of this Chapter). Fire protection issues are a concern in the wildland-urban area, which may limit future subdivision activity.

FLORA

The Montana Natural Heritage Program (MNHP) identifies one sensitive flowering plant species of concern (Lesser Rushy Milkvetch) in the area surrounding Helena. Most of Helena's plant materials (flora) have been intentionally planted as people have developed individual properties. (The City's landscaping requirements are addressed in the Helena Zoning Ordinance.) Since the area receives less than twelve inches of rainfall

a year, alternative landscaping that takes into consideration drought-tolerant plans, deer-resistant plants, and other alternatives for landscaping should be considered.

Weeds

Nuisance and noxious weeds are a concern in Helena. The City of Helena works closely with the Lewis and Clark County Weed Board to enforce noxious weed control. City Code defines noxious and nuisance weeds as well as property owners' responsibility to control noxious weeds on their property. The County has adopted a weed-management program that reviews the distribution and abundance of each noxious weed species known to occur within the district and specifies herbicide management goals and procedures. The City's weed-management program generally refers to nuisance weeds if they are a fire hazard. State law also requires a re-vegetation plan for subdivisions that is submitted to the County Weed Board for approval. The City is currently revising the weed ordinance to better enforce weeds and wildland fire hazards, and could require city operations or contracts to include weed-free materials and construction methods.

> Noxious weeds are plants that have been imported from other areas, so they have no natural biological controls. As a result, they are outcompeting and displacing many native plants.
>
> Montana Plant Life website (montana.plant-life.org)

(See Appendix for additional information.)

FAUNA

Helena's natural environment contains wildlife (animals that are not domesticated or tamed) and their habitat. Wildlife habitat is defined as an area containing the complex of environmental conditions essential to wildlife for feeding and forage, cover, migration, breeding, rearing, nesting, or buffers for those areas. It may also include areas essential to the conservation of species protected by the Endangered Species Act or of special interest or concern to the State of Montana.

Rural areas are more conducive to wildlife and wildlife habitat than are urban areas. Although urban areas are not intended to preserve wildlife habitat, certain natural features, such as wetlands, stream corridors, and similar high value habitats, are irreplaceable and should be preserved and buffered as much as possible. These areas may provide a variety of wildlife habitat as well as recreational, water quality, and safety values, such as flood control.

Encouraging subdivisions within the City's Growth Policy study area provides housing and development opportunities within an urban setting, reducing development pressures on surrounding rural areas and rural wildlife habitat. Urban density development is not intended to meet the habitat needs of larger wildlife such as deer, moose, or elk or of predatory species such as bear, mountain lions, or coyotes.

Species protected by the Endangered Species Act or of special interest or concern to the State of Montana or the City of Helena should have their habitat preserved. In the area

surrounding Helena, the Montana Natural Heritage Program has noted two mammals in the sensitive category and one mammal as threatened or special status (Canada lynx); two amphibians as sensitive; and eleven birds, with seven identified as sensitive and one threatened or sensitive (bald eagle).

Mule deer have made their home inside the City in addition to the surrounding areas. The deer have presented conflicts for some residents by eating their ornamental landscaping or by occasional aggressive behavior. An urban deer task force extensively studied the problems and prepared a plan to address the issues. By March 2010, the City had culled a total of 400 deer. The Plan's goal, as adopted by the City Commission, is to achieve an average ratio of 25 deer per square mile over time. (See Appendix for additional information.)

In addition to deer, the adjacent mountains to the south also provide habitat for elk, coyotes, foxes, and occasional black bear and moose, along with numerous birds and non-game animals. Sandhill cranes have been reported within the northern part of the City and northeast of the City. Antelope use the grassy areas located to the southeast, east of I-15. The riparian areas provide important wildlife habitat and wildlife travel corridors and contribute to the community's sense of place. Wildlife management issues will continue to be a development consideration for subdivisions and annexations as the City grows in the future. Designing artificial wetlands with new and renovated stormwater infrastructure can offset development's inherent impacts to wildlife.

Montana Fish, Wildlife and Parks published *Building with Wildlife – a guide to conservation-oriented development* to help reduce wildlife conflicts with new subdivisions. The Helena City Codes could be amended to consider these guidelines when evaluating subdivisions and other developments located in areas used by wildlife.

AGRICULTURAL LANDS

The Helena Valley has historically been used for agricultural production. As the population grows, economic pressures promote the conversion of agricultural lands into higher value residential use. Some property near the City that could be annexed and served by City services is currently in agricultural use, including some irrigated farm lands.

Agricultural lands are shown on the Existing Land Use map as Agricultural/Low Density and are defined as "tracts of land over 5 acres that include agricultural uses, wooded areas, single unit residential, mixed uses, etc. and may also include vacant land and non-residential uses on large tracts of land over 5 acres."

Annexation and development of these properties for uses other than agricultural production would reduce the amount of agricultural land in the Helena area; however, not annexing those lands does not ensure that they will remain in agricultural use. Low density residential development located outside the City often uses more agricultural land per dwelling unit than higher density development within the City.

Although annexing agricultural lands into the City may reduce the amount of land in agricultural production in the short term, the higher density city development could reduce the pressure to convert additional agricultural lands farther from the City. Promoting infill development and annexation of lands near the City can encourage higher density development, thereby reducing the pressure to develop agricultural lands with lower density uses.

OPEN SPACES

Mount Helena

Open space is defined as "any public land that is provided or preserved for park or recreational purposes, for conservation of land or other natural resources, or for historic or scenic purposes."

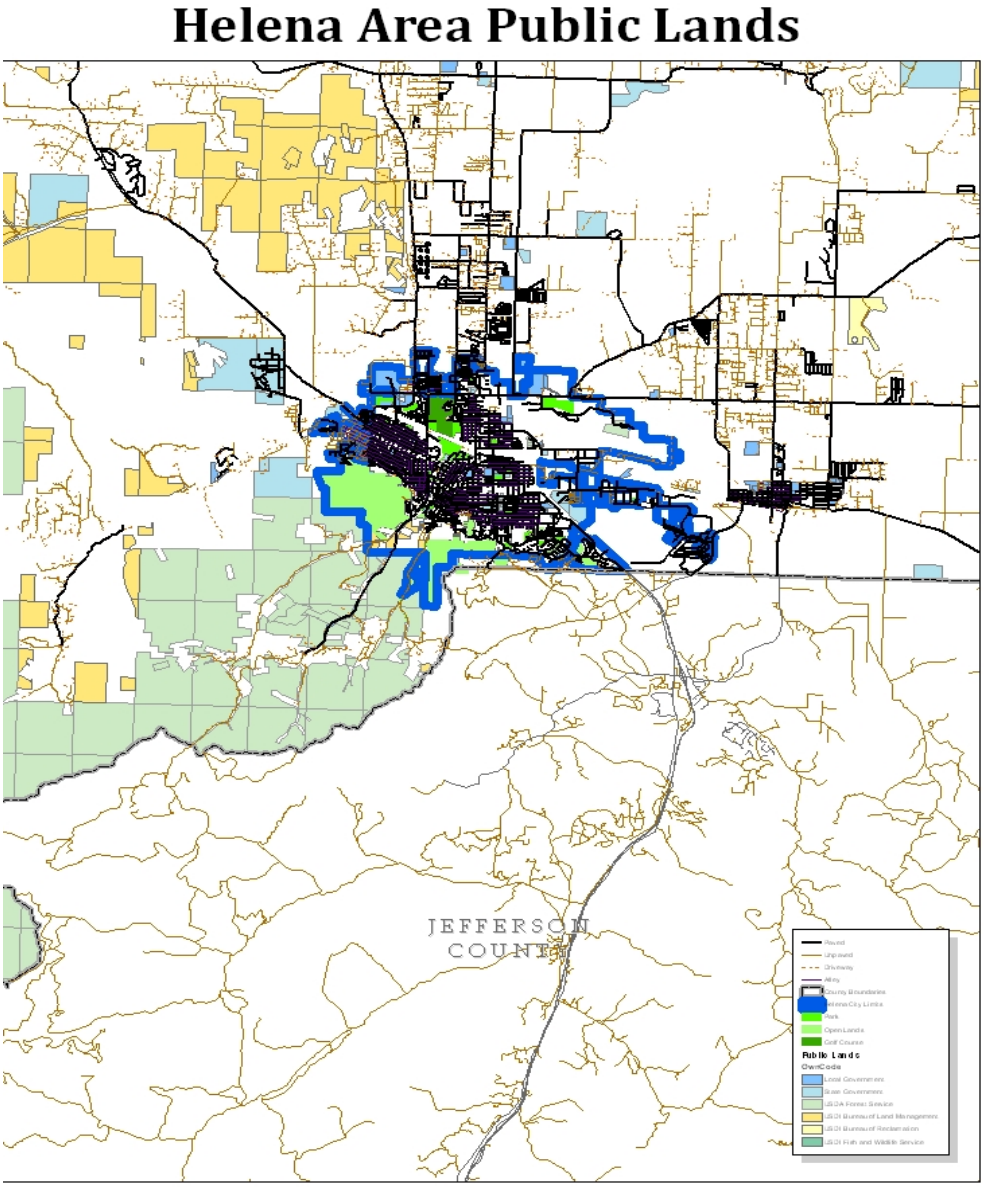
Helena's greatest natural resources include its wooded back drop and open spaces. These areas provide not only an aesthetic value, but also recreational opportunities and wildlife habitat, and include city parks such as Mt. Helena and Mt. Ascension, state and federal lands, and privately held lands—some of which are preserved through conservation easements.

At this time, the biggest threat to the treed areas is the mountain pine beetle epidemic, which has resulted in sudden and significant pine tree mortality over extensive portions of Helena's wooded lands. This epidemic will have a significant impact on the appearance of the City's back-drop for years to come. The City has taken an active role in preserving these special areas through various activities such as thinning parklands and supporting the "Open Lands Fuels Reduction and Restoration Strategy." Continued funding to manage Helena's open space lands will be imperative in retaining this precious resource.

Other threats include wildland fires, noxious weeds, private development, and over-use as recreational lands. Forest management, including thinning densely wooded areas and the use of conservation easements, could help preserve these open space areas. Public access and use of natural open space should be permitted, where feasible.

Environmentally-sensitive areas should be protected against overuse, and regulations should be adopted to protect open space areas.

The Public Lands map identifies areas surrounding the City that are owned by the City of Helena (including parks, open lands and the golf course), the State of Montana, Forest Service, and the Bureau of Land Management.



Map source: Lewis and Clark County GIS map

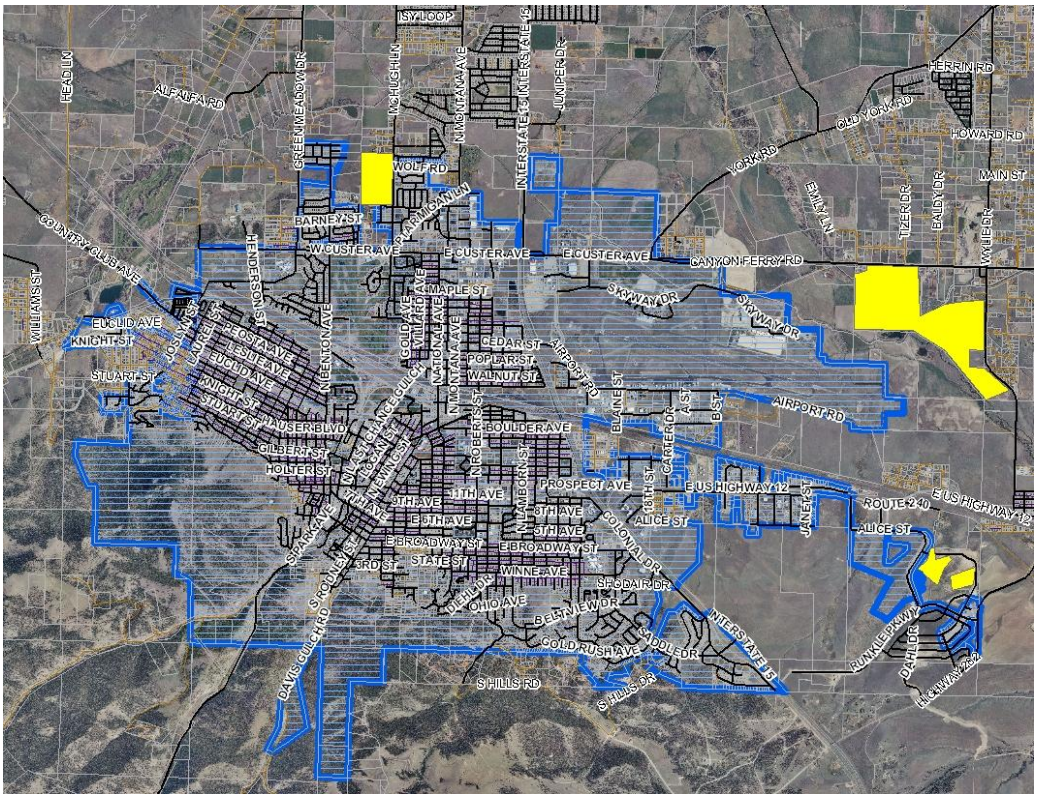
SAND AND GRAVEL RESOURCES

Gravel is an important component in many construction activities and is essential for future development in the area. Gravel extraction can be noisy and dusty and include extensive truck traffic, which can conflict with other land uses. Balancing the need for gravel and the pressure to provide land for homes to accommodate the incoming population can be difficult, but is important.

There are no gravel open-cut mining operations within the Helena City limits, and such operations are not permitted by current zoning. Operations of this nature are close to Helena—west of McHugh Lane, east of Alice Street, west of Wylie Drive, and south of Canyon Ferry Road. Their close proximity to the City could influence land-use decisions for properties located near the gravel operations but within the City. Once the gravel extraction has been completed, some of these properties may eventually be annexed and converted to other uses.

The Gravel Operations map shows three locations of existing gravel operations within the Growth Policy Study Area boundary as yellow. Other gravel operations exist in the Helena area, but are located outside the Growth Policy Study Area.

Map of Gravel Operations within the Helena Study Area



Map source: Lewis and Clark County GIS map

PUBLIC HEALTH AND SAFETY

AIR QUALITY

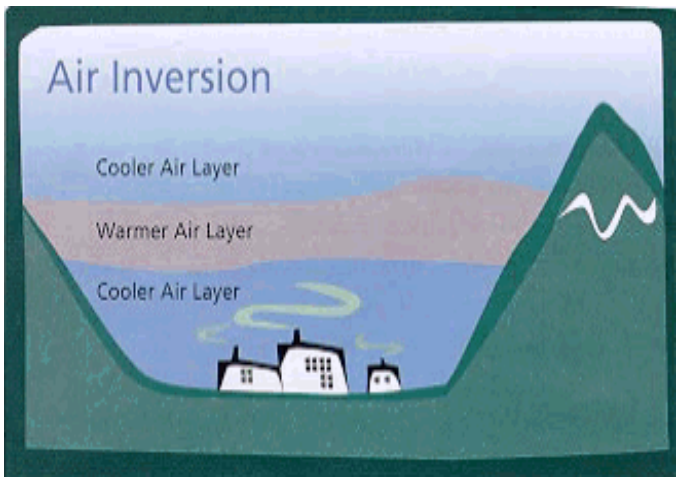
Helena and its residents are affected by the air quality of Lewis and Clark County. Helena's air quality is generally good because of winds that scatter pollutants. Air inversions occasionally occur during winter, creating poor air-quality days until the wind disperses wood smoke, dust, particulates, and pollutants.

Air Quality

Fiscal Year	Good Days	Watch Days	Poor Days	Poor Days due to Forest Fire	EPA Exceedance of standard
2008	350	8	8		1
2007	332	28	5	5	0
2006[3]	363	2	0		0
2005	362	1	2		1
2004[2]	347	13	5		0
2003[1]	120	0	0		0
2002	120	0	0		1
2001	119	1	0		1
2000	117	3	0		1
1999	120	0	0		0

Lewis and Clark County Health Department

[1]Air quality monitoring days November 1 to March 1 – 1999 – 2003 (total of 120 days)
[2]Air quality monitoring increased to 365 days per year in 2004
[3]EPA air quality standard changed from 65µg/m^3 to 35µg/m^3 December 2006



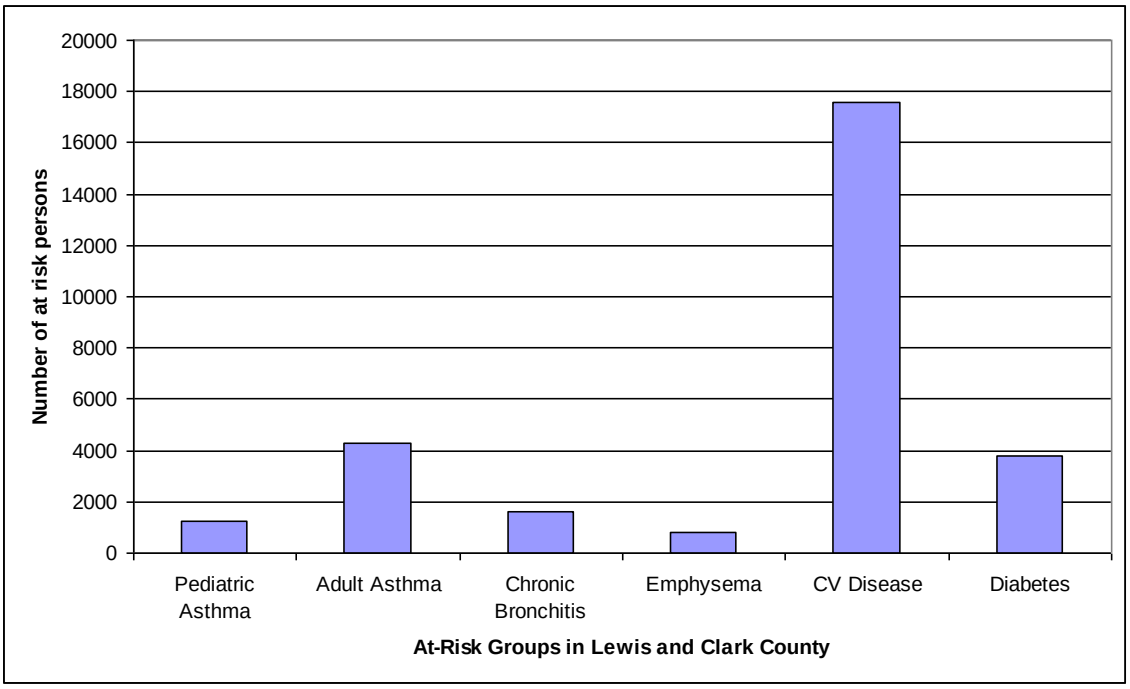
The Lewis and Clark County Clean Outdoor Air Ordinance, adopted in 1986, prohibits the operation of any wood stove during poor air-quality episodes and limits the opacity of smoke released from wood stoves. It also limits the idling of diesel engines during poor air-quality episodes. At the time of this writing, the ordinance is being rewritten to reflect new Environmental Protection Agency air quality standards.

Certain groups, such as children, older adults, and people with lung diseases like asthma and cardiovascular (CV) disease, are especially vulnerable to the effects of air pollution as shown on the graph from the American Long Association's "State of the Air 2009" report.

(See Appendix for additional air quality information.)

Air Pollution and Groups at Risk

Source: American Lung Association's "State of the Air 2009" report - http://www.stateoftheair.org



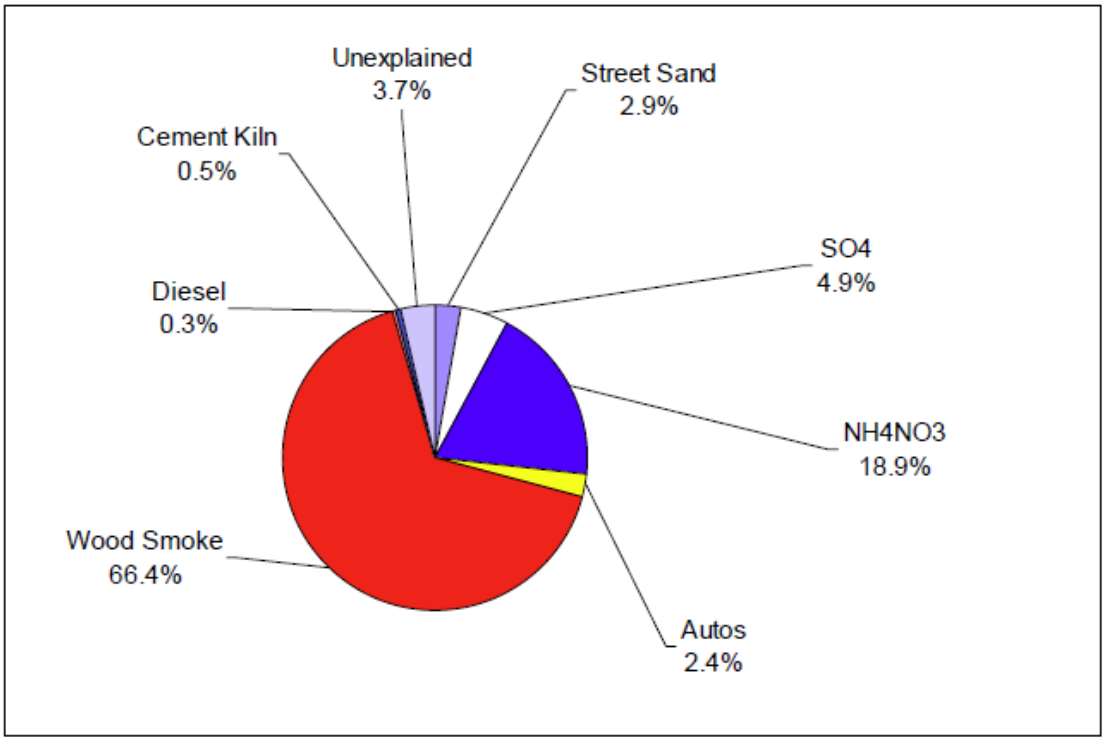
Local Monitoring

The Health Department operates one continuous air-quality monitoring station in cooperation with the Montana Department of Environmental Quality (DEQ). DEQ contracted with the University of Montana Center for Environmental Health to conduct a source apportionment study for fine particles in the (ambient) air 2.5 micrometres or less in size (known as PM 2.5) during the winter of 2007-2008. A similar study has not been done beyond the winter months.

Winter air quality in the Helena valley is dominated by the effects of frequent air inversions, which can trap pollutants like wood smoke under air masses of different temperatures. The Health department monitors air quality conditions closely during the period from November 1 to March 1 and enforces no-burning rules during poor air quality episodes.

Wood smoke was the major source (66.4%) of PM2.5. Other sources include ammonium nitrate (NH4NO3) and sulfate (SO4). The study determined that, in addition to residential woodstoves, various emissions also could have come from smoke for prescribed fires, residential open burning, small industrial sources, heavy duty vehicles, natural gas furnaces, decaying livestock waste, chemical fertilizers, sewage treatment plants, biological processes in soils, and home heating oil. The category of "street sand" includes dust from unpaved streets. This information is shown on the following PM2.5 Source Contributions Estimates graph.

Helena, Montana PM2.5 Source Contributions Estimates – Winter 2007-2008



Source: The Helena, Montana PM2.5 Source Apportionment Research Study, Nov. 2008

Vegetation—particularly trees in City parks and open spaces and landscaping on individual properties and in the boulevards—may help offset some of the negative effects these pollutants have on air quality. Trees also provide a cooling benefit which helps offset some of the heat gain from paved parking lots. Landscaping requirements in the City's Zoning Regulations should be reviewed for options to maintain and improve air quality. Since automobile emissions can have a negative impact on air quality and the climate, the City's Subdivision Regulations require subdivisions to have an efficient transportation system that accommodates future connectivity and non-motorized travel modes. An overall formal management strategy that includes a prioritized urban forestry program should be developed and implemented to address these issues holistically.

The City should maintain its good air quality to avoid increased mitigation requirements and expenses, including health-care costs. Urban densities and residential development within the City and in close proximity to employment and services reduce vehicle miles traveled and promote more efficient use of land, infrastructure, and the transportation network. As a result, the potential for air pollution can be reduced, and development pressures on the natural environment can be lessened.

WATER

Surface and Ground Water

Water is a fundamental natural resource. Although Helena's annual precipitation is less than twelve inches per year, the Helena area has numerous streams, rivers, lakes, wetlands, and riparian areas. The abundance of this natural resource in a semi-arid region is a significant asset to Helena. These water bodies support wildlife habitat, agriculture, and recreational activities, such as boating and fishing. They also provide a source for municipal water.

Subdivision impacts to ground and surface waters, water bodies, drainages, floodplains, riparian areas, and wetlands are evaluated. Adequate buffers or appropriate mitigation should be required, including but not limited to, storm-water treatment and discharges to improve the viability of wetlands. Irreplaceable natural features such as wetlands, stream corridors, and similar high-value habitats should be maintained and buffered to provide wildlife habitat and recreational, water quality, and safety values such as flood control.

The Ten Mile watershed, one of the areas providing municipal water, is affected by the current pine beetle infestation. The 2009 Helena Climate Change Task Force Action Plan warns that the pine beetle infestation is moving through the watershed, and there are no practical means of preventing this. When pine trees die and "red" needles remain on the tree, risk of ignition is heightened. However, even live pine trees easily ignite.

If a Ten Mile wildfire ignites with warm temperatures, low moisture content in trees, and high winds, suppression of the fire will difficult, if not impossible. Such a fire would pose significant risks to public safety, water quality, and movement of soils, sedimentation / erosion, recreation, and other important values. (See additional discussion under the Wildfire Risk section of this chapter.)

The 2009 Helena Climate Change Task Force Action Plan addresses the "Vulnerability of the Helena Municipal Water Supply to Disruption by Climate Change," and identifies recent trends*:*

- The past decade of stream flow data in the Ten Mile drainage shows a downward trend in the volume of water discharged by the watershed;
- Amount of moisture in the snow pack has shown a steady downward trend in the past four decades.

USGS data for the Missouri River at Hauser and Holter Dams, from 1923-2009 and 1946-2009 respectively, provides a long-term perspective and indicates water flows fluctuate from below normal to above normal. Water flows may be related to the amount of precipitation received in a particular year and the amount of flows manually released at each dam. From 2000-2009, these portions of the Missouri River had lower flows in the beginning of the decade than in the past 3 years. (http://waterdata.usgs.gov/nwis/)

These climate trends have already manifested themselves locally in the number and duration of wild fires and in an epidemic of bug-killed trees in the forests. These trends suggest that the Helena municipal water supply may be vulnerable not only in the Ten Mile drainage, but also, over time, in the upper Missouri drainage.

Further improvements to the Missouri River Water Treatment Facility will be required to meet the projected demands in 2025. During peak usage, the Climate Action Plan contemplates full utilization of both the Missouri and the Ten Mile facilities. However, the vulnerability of the Ten Mile watershed casts serious doubt on the ability of that facility to operate at maximum capacity during periods of peak demand — not because of limitations of the treatment capacity of the plant, but because of the limits to the yield of the watershed. The clear vulnerability of the Ten Mile watershed to damage from wildfire and bug-kill makes it seem an especially fragile watershed in the face of current climate trends.

The Missouri River Facility's connection to Canyon Ferry Dam offers some buffer from the peaks and valleys of yield from the headwaters watershed, but, there are some indications that surface water discharges from the upper Missouri have already experienced substantial decline in recent decades. Review of historic flows at the U.S.G.S. gauge on the Missouri at Toston indicates that annual average volume of inflow into Canyon Ferry over the past ten years has decreased by nearly 37% in relationship to the 109-year average proceeding the last decade.

Potential Threats From A Warming Climate

There may be a point at which the capacity of the Missouri River facility to meet the projections could come into question. If significant parts of the headwaters watershed become as vulnerable to bug kill and potential for wildfire as Ten Mile, the ability of the Missouri River plant to meet its supply projections could be compromised.

Climate projections indicate not only a warming climate, but also smaller snow pack, earlier runoff, smaller volumes of water available within the watershed, lower mid-summer flows, and greater frequency and intensity of wildfires. The landscape management recommendations of the 2009 Ten Mile Watershed Collaborative Committee are intended to protect and improve watershed water quality and quantity; protect City water delivery infrastructure; promote potential for restoration in watershed of a viable fishery and wetlands; reduce damage of major wildfire; protect and improve long-term quality of wildlife habitat; and provide for present and future public safety.

The threats of warming climate are especially acute in the Ten Mile watershed where yield already shows indications of being insufficient to meet the projected needs in 2025. Because it is a smaller, less diverse drainage than the headwaters of the Missouri, its vulnerability to disruption from a warming climate is substantially greater than is the vulnerability of the Missouri River facility.

In the Missouri watershed, while the diversity and expanse of the drainage area make it less vulnerable to a single catastrophic event such as wildfire, the flow declines of the recent decade suggest the Missouri system is not invulnerable to the effects of climate change. Finally, because the Missouri River facility is dependent upon the structural integrity of Canyon Ferry Dam, catastrophic failure of the dam would result in a sudden and calamitous loss of water supply.

The vulnerabilities described above are heightened by the reality that the City of Helena has no other feasible options for large-scale augmentation of its water supply beyond Canyon Ferry Dam. In addition to increasing water supply, minimizing per capita water use and encouraging water conservation can become more important. Options can include onsite landscaping requirements that don't require as much water, programs to assist with installing water conservation measures, promote water conservation education, and improve water infrastructure efficiency.

The Climate Change Task Force recommended a multi-faceted conservation strategy that addresses infrastructure conservation opportunities, the rate structure, outreach and education, conservation incentives, and conservation regulations. Water recommendations identified in the 2009 Helena Climate Change Action Plan are included in the Climate and Climate Change section of this chapter. Water and its impact on Helena and the surrounding area, including wetlands and riparian areas, are discussed more fully in the **WATER** Chapter; Helena's water infrastructure is addressed in the **PUBLIC FACILITIES** Chapter.

DEVELOPMENT CONSTRAINTS MAP

The development constraints map identifies certain environmental issues within the City of Helena—and up to approximately 4.5 miles from the city limits—that can affect the location of land uses and the type of development standards that may be required. This map shows the general locations of floodplains (blue), liquefaction (areas prone to decreased structural support during an earthquake due to high groundwater and soil type - brown), and wildland-urban interface areas (red) that may be more susceptible to risk of wildfire.

The map also identifies the Airport Noise Influence boundary (yellow). The area that can be more easily served by City water and sewer if the mains are extended is shown with the purple boundary; this boundary is also proposed for the urban standards area. Each of these development constraints is addressed in this chapter.

See Development Constraints Map (electronic link or map at the end of this Chapter)

WILDFIRE

Helena contains a forested area along the South Hills to the south and southwest; a portion of the South Hills shares a border with the Helena National Forest. The City is vulnerable to wildfire because of increased fuel load accumulations, topography, high winds, changes in climate, and urban development along the South Hills. This area is approximately seven miles long and traverses from Interstate 15 to Mount Helena and beyond. The width cannot be accurately defined because of the various fuel types and structures that intermix or intermingle across this area.

The portion of the South Hills located within and adjacent to the City of Helena contains many of the conditions associated with a Wildland-Urban Interface (WUI) setting. This area has a Ponderosa Pine-type forested area with an under-story of Douglas fir intermixes and grasses, as well as varied topographical features. The predominant uses of this area are residential and recreational open space. The South Hills also provide the community with a valued view-shed and community back-drop.

THE WILDLAND-URBAN INTERFACE IS DEFINED AS THE AREA WHERE HOUSES OR BUSINESSES, OR WHERE HUMANS AND THEIR DEVELOPMENTS, MEET OR INTERMIX WITH WILDLAND OR VEGETATIVE FUEL.

As population and recreational uses increase along the South Hills, the number of fires and potential fire impact may increase. Helena is vulnerable to wildfire along the South Hills because of the accumulation of fuels from increased number of beetle-killed trees, urban development, and the wildland setting, varied topography, and areas with limited access.

The southern portion of the City is located in the WUI and has the potential for human-environment conflicts such as wildland fires, habitat fragmentation, and invasive plant species.

Fires in the wildland-urban interface burn with greater intensity because of decades of aggressive fire prevention and suppression, extended periods of drought, high seasonal temperatures, and high winds, thus, altering the normal fire regime. Wildland fires are also a greater concern today because of development that intermixes with the WUI, the accumulation of fuels on the ground or extensive stands of trees displaying ladder fuels, a closed canopy, and a high vulnerability to fire from human activities and natural causes. The secondary effects of a wildland fire, such as soil erosion, the spread of noxious weeds, flash flooding, landslides, and loss of wildlife habitat, can be seen long after the flames have been extinguished. These areas may not return to pre-fire conditions for decades.

Wildland fires from the summer of 2007 have made clear the immediate threat that these types of fires pose to Helena's urban areas. The 2007 fires, including the Fort Harrison artillery range fire in July and the Orofino Gulch and Spring Meadow Lake fires in September, spread—or had the potential to spread—into the WUI, threatening many homes and prompting evacuation orders. The increase in wildland fires near population

centers (for example, the Cave Gulch, and Bucksnort fires of 2000) over the past decade has increased the level of awareness and the need for mitigation in the WUI setting. The 2009 Ten Mile Watershed Collaborative Committee Recommendations attempt to manage the landscape with a defined set of treatments. This water shed is further discussed in Chapter 8, **WATER**.

The Helena Fire Department's inventory of structures with wood shake roofs—a potential fuel source—identified approximately 1,081 properties that would be at an increased fire risk because of roof materials that are not compatible in a WUI setting. In 2006 the Helena National Forest used the "Behave" computer-modeling program to determine the potential for a wildland fire from spot fires (fire embers blowing from the fire location and starting another fire where they land).

See 2007 Spot Fire Map (electronic link or map at the end of this Chapter)

The Tri-county Fire Safe Working Group fuel loads map indicates the density of fuel loads on both public and private lands for Lewis and Clark County.

See 2005 Fuel Loads Map (electronic link or map at the end of this Chapter)

The 2005 Community Wildfire Protection Plan, 2003 City of Helena Open Lands Management Plan, emergency response plans, interagency agreements with other rural fire departments and fire-related agencies, and City departmental roles were reviewed and analyzed. In response to public safety concerns, the City adopted an ordinance mandating fire retardant roofs and vent requirements for all new roofing and in some cases reroofing projects throughout the City. (See Appendix for more information.)

This area has recently been invaded by pine beetles. These small beetles bore into the tree, leaving a fungus that attacks the tree and kills it. As a result, significant portions of the surrounding forests are succumbing to this onslaught, increasing the potential for wildfire. The remaining dead trees can become unstable, creating a safety hazard for anyone walking in the area.

Some property owners have chosen to burn the dead trees. However, burning can affect air quality by generating smoke and may affect climate change. Most people in the City do not have the required space from buildings to conduct open burning nor the expertise to burn large logs without posing a hazard. An option may be for the City to investigate providing containers or proper locations where people can take their beetle-killed trees for chipping or burning. Another alternative may be to explore using the killed trees for biomass fuel generation (fuel energy that can be derived directly or indirectly from biological sources).

FLOODPLAINS

The development constraints map shows the 100- and 500-year floodplain locations along Ten Mile and Prickly Pear Creeks. Ten Mile Creek is located north and northwest

of the City, within a mile of the City, bordering an area that could be developed in the future. The floodplain along Prickly Pear Creek extends through East Helena and continues north and east of the airport. These areas tend to have higher groundwater than property located farther from the floodplains. Some limited floodplain areas are located within City limits.

The City of Helena has adopted a Floodplain Ordinance and building codes to address construction standards that will affect the identified floodplain areas as the City grows to the north and northwest. Development is prohibited in the 100-year floodplain, while development in the 500-year floodplain requires buildings to be elevated without basements.

EARTHQUAKES AND LIQUEFACTION

Several earthquake faults are shown on the development constraints map. Helena is located in seismic design category D_o (formerly seismic zone 3) for earthquake potential. In 1935, Helena received extensive damage from a series of significant earthquakes and aftershocks. Occasional earthquake activity has been felt in the area since that time, and another large earthquake is anticipated.

Additionally, a large portion of the Helena Valley has been identified as susceptible to liquefaction, shown on the development constraints map as low, moderate, and high susceptibility. The United States Geological Survey (USGS) defines liquefaction as "loss of strength of loosely-packed, waterlogged sediments in response to strong ground-shaking; a cause for major damage during earthquakes." A geotechnical analysis would provide site-specific soils information to better determine liquefaction potential.

Because of the earthquake potential associated with the seismic design category D_o designation, certain building code standards are required for all construction. Compliance with these building codes means buildings will better withstand earthquakes and the accompanying liquefaction.

NOISE AND LIGHT

Excessive noise and light can be forms of pollution and are regulated by City Code.

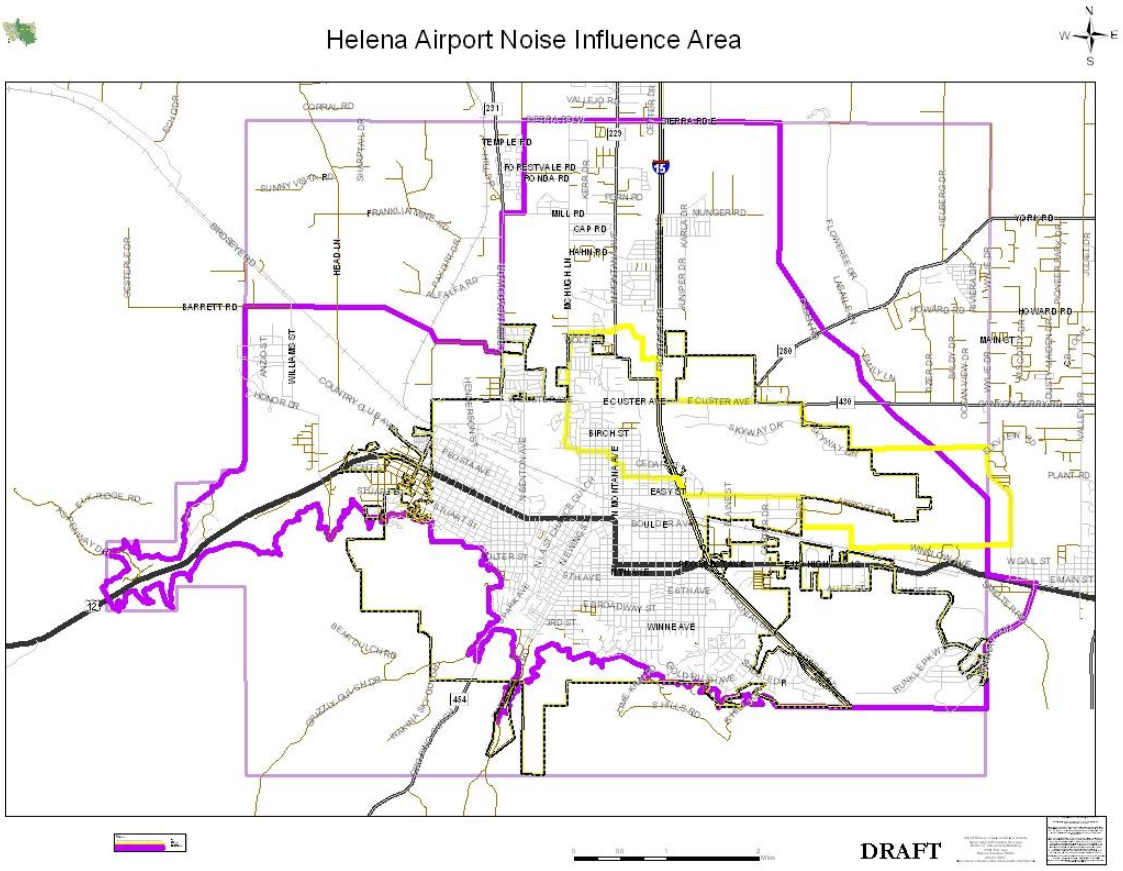
Noise

City Code restricts outdoor noise by identifying acceptable noise levels, unlawful noise, and penalties for violations. Highways, airplanes, and trains can be noise generators. The 2004 Montana Department of Transportation (MDT) *TRAFFIC NOISE IN MONTANA: Community Awareness and Recommendations for a Rural State* study identified significant areas for traffic noise in Helena. Major traffic-noise impact areas include I-15, the railroad corridor, and most of the major arterials: Custer Avenue, 11th Avenue, Broadway, Benton Avenue, and some parts of Montana Avenue. Minor traffic-noise impact areas include U.S. Highway 12, Last Chance Gulch/Cedar Street, Prospect Avenue,

Roberts Street, and some parts of Montana Avenue. Noise impact areas expected to develop within ten years include Green Meadow Drive and parts of I-15 and Custer Avenue.

The 2008 MDT report *Growing Neighborhoods in Growing Corridors: Land Use Planning for Highway Corridors* identifies the following noise-sensitive land uses: residences, hospitals, nursing homes, daycare centers, schools, hotels, motels, places of worship, public meeting rooms, auditoriums, and libraries. Noise mitigation could be helpful when developing in noise-prone areas.

Montana law identifies requirements for airports as they affect land uses (67-7-201 MCA). The City has an Airport Noise Influence overlay district that includes part of the north-central and northeastern portion of the City and extends east of the Helena Airport into the county. The City's Zoning Ordinance identifies prohibited uses in the overlay district: hospitals, convalescent homes, and related health-care facilities; multi-family rental housing intended primarily for the elderly; schools; libraries; and theaters and other indoor or outdoor performing arts facilities.



Map source: Lewis and Clark County GIS map

Military operations can create noise and present safety concerns for nearby communities due to the operations of military aircraft and training exercises. Such operations can adversely affect the surrounding community when development occurs in close proximity to the military base.

Fort Harrison has completed a study that identifies some of the noise impacts associated with its military operations. Although this noise study has not been adopted by the City, it may be one of several factors to consider when development is proposed near or adjacent to the installation.

Light

The wonders of the night sky, such as constellations, shooting stars, and the occasional aurora borealis, are a natural resource that can be diminished by urban lights. Although maintaining this resource to the greatest extent possible can help maintain the quality of life in Helena, a balance between pedestrian safety, deterring criminal behaviors and enjoyment of the night sky must be considered. Providing guidance and regulation of commercial lighting and street illumination could help balance these lighting interests.

The public's desire to see the stars at night resulted in the 1999 adoption of regulations to address outdoor lighting requirements and restrictions to reduce light pollution that interferes with enjoyment of the night sky. The lighting ordinance recognizes that the topography, atmospheric conditions, and nature of the City are unique and valuable to the community and encourages lighting practices and systems that will minimize light pollution, glare, and light trespass; conserve energy and resources while maintaining nighttime safety, utility, and security; and reverse the degradation of the nighttime visual environment.

LED solar lights debuted in Helena in the parking lot for the Department of Environmental Quality building (formerly the National Guard Armory), with the Four Georgians School parking lot following suit in summer 2010. These lights use energy-efficient, long lasting solar-powered LED bulbs, compliant with the City Lighting Ordinance and may become used more by other businesses in the future.

CLIMATE AND CLIMATE CHANGE

Scientific studies indicate the earth is getting warmer and will continue to do so well into the future. Issues center on the speed and severity of the impacts and whether policies for mitigation and adaption can be adopted with implementing actions. (See Appendix for more information.)

Greenhouse gases—including water vapor, carbon dioxide (CO2), methane (CH4), ozone (O2), nitrous oxide (N2O), and halocarbons—and their effects have become the key indicator for climate change. The principal greenhouse gas emitted by human activities is carbon dioxide, which is produced by burning fossil fuels such as coal, oil, and gas. Vegetation stores large quantities of carbon, so carbon dioxide is also released by deforestation and land clearing.

Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and the decomposition of organic wastes in municipal solid waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels.

It is generally believed that the increased concentration of greenhouse gases in the atmosphere enhances the *greenhouse effect,* which naturally traps the sun's warmth in a blanket of gases in the lower atmosphere, up to six miles above the ground, thereby maintaining the Earth's temperature to support life. Additional gases trap more heat in the atmosphere, contributing to climate change.

Because of the volume of greenhouse gases (GHG) already emitted into the atmosphere, scientists believe that the effects of human-induced global warming cannot be eliminated. However, the rate and volume of GHG emissions can be reduced, lessening the dangerous impacts on ecosystems, communities, and human health. The built environment is a primary contributor to GHG emissions and climate change, making good planning fundamental to creating and implementing policy solutions.

Montana's Picture

Montana also will be affected by climate change. According to the November 2007 *Montana Climate Change Action Plan: Final Report of the Governor's Climate Change Advisory Committee*, Montana's electricity generation, heating needs, commerce, agricultural practices, and transportation needs accounted for 0.6% of the GHG emissions in the United States in 2005. The state's forests, cropland, and rangeland provide a vast terrestrial *carbon sink* that helps balance the state's emissions. However, a 14% increase in GHG emissions from 1990 to 2005 moved Montana from a net carbon sink to a net carbon emitter, and the state now averages net emissions of approximately 12 million metric tons of carbon dioxide equivalents per year. Montana's rate of GHG emissions per capita is nearly double the national average. The reasons for this are varied, but include the state's large fossil-fuel production industry, substantial agricultural industry, large distances for transportation, cooler climate, and low population base.

Helena's Situation

The City Climate Change Task Force, a temporary advisory committee, was appointed to assess municipal greenhouse gas emissions by constructing a baseline emissions inventory and forecast; examine the City's energy use and propose potential strategies for reducing waste and obtaining power from renewable resources; and examine the City's current and projected sources of water supply and the vulnerability of the water delivery and management systems to climate-related disruption. The Task Force recommended specific actions to the City Commission to reduce both municipal and community greenhouse gas emissions levels and increase the resilience of municipal public works in the face of global climate change. The Task Force also identified public and private partnership opportunities to maximize strategies to reduce greenhouse gas emissions throughout the Helena community.

The 2008 inventory of greenhouse gas emissions by City-owned operations was used to analyze changes in the City's energy use and carbon emissions between 2001 and 2007. The inventory showed significant decreases in both energy consumption (22.1%) and associated carbon emissions (18.1%) by 2007. Much of that reduction occurred in the water and wastewater treatment plants, which were (and continue to be) the City's largest category for both energy and carbon. The analysis also showed a 15.9% reduction in energy use in City buildings, and a 17.5% reduction in building-related carbon emissions. Other categories showed relatively modest increases. The overall net energy savings had a substantial beneficial impact on the budget. Without those reductions, the City would have paid more than an additional half a million dollars every year on its energy bills.

Despite these impressive improvements, the City's energy bill still rose by 61% (in nominal dollars) over this period because the efficiency gains were insufficient to fully counter the impact of rising energy prices. The overall price of energy paid by the City more than doubled over this time period.

Projects that are currently underway (such as the LED traffic light replacement project, Legion Field lighting project, and the Wastewater Treatment Plant Stirling Engine project) are not yet reflected in these results. Recommendations will be developed in the future to expand upon the City's efforts to reduce its emissions, saving taxpayer dollars and helping the environment.

ENERGY ALTERNATIVES

Energy for power and heat is provided to the community by a variety of traditional sources (natural gas, coal, nuclear, hydropower, etc.) which all have environmental costs. Alternative energy sources, such as solar, wind, geothermal, and biomass, are renewable and have been receiving more attention for new construction and retrofits. The City has a proactive opportunity to lead to the future by recognizing its role in the broader environmental picture.

Green building generally refers to construction practices, structure design, and operations that provide workplace safety and comfort, save energy and water, and favor the use of recycled or environmentally-friendly construction materials. The Montana State Fund recently erected a new structure to meet the LEED (Leadership in Energy and Environmental Design) standard, a standard of environmental performance by the U.S. Green Building Council. Development is required to comply with the adopted International Energy Conservation Code. As the City looks to encourage similar projects, zoning incentives such as increased building height or lot coverage, or density bonuses could be created for energy conservation,

Solar

Photovoltaic (PV) systems produce electricity from sunlight. Solar thermal collectors also can be used to heat hot water tanks and buildings. In addition, solar energy can be used for space heating and cooling through solar architecture, as well as building

designs that consider placing windows or other openings and reflective surfaces to take advantage of the sun's energy and light. Helena has approximately 186 clear days and partly cloudy days a year, making the area suitable for active and passive solar gain.

Solar thermal and PV systems are becoming more affordable because of decreasing prices for materials, advances in electrical inverter technology, and increasing utility costs. Solar energy design concepts are increasingly being incorporated into building design features. The proper building materials, architecture, site orientation, and sun exposure are important factors when considering solar. The layout of the street grid can affect solar potential. A site assessment can identify a property's potential for taking advantage of active or passive solar energy.

Wind

Wind can be used to generate electricity if the wind is consistent and sufficient. The Helena area generally does not have the wind speed or wind density power to operate most turbine applications, although a few locations, such as exposed hilltops, might be suitable. A site assessment can determine an individual property's potential for wind power.

Geothermal

Geothermal energy uses heat from within the earth. The steam and hot water produced inside the earth are used to heat buildings or generate electricity. Geothermal power plants use water (hydro) and heat (thermal). They require high temperature (300 to 700 degrees Fahrenheit) hydrothermal resources accessed by drilling wells one to two miles into the earth and piping the steam or hot water to the surface.

The United States generates more geothermal electricity than any other country, but the amount of electricity it produces is less than one-half of a percent of electricity produced in United States. Only four states (California, Nevada, Hawaii, and Utah) have geothermal power plants.

Biomass

Biomass is organic material made from plants and animals and contains stored energy from the sun through photosynthesis. Some examples of biomass fuels are wood, crops, manure, and some garbage. When burned, the chemical energy in biomass is released as heat, becoming biomass fuel. Wood waste or garbage can be burned to produce steam for making electricity or to provide heat to industries and homes. Biomass depends upon having a constant supply of organic materials to convert to fuel or power and the means to get the organic material to the conversion facility. Air pollution may be an environmental consideration when burning biomass.

Energy Conservation

Energy conservation measures and alternative energy sources should be explored for

City-owned buildings to make them more self-sufficient. The Climate Change Committee identified options to encourage self-sufficiency, including an energy coordinator who could actively improve the City's energy independence. To help property owners take advantage of solar gain, solar considerations could also be incorporated into the City's Subdivision and Zoning Regulations.

World production has been nearly flat for the last few years. If the price of gasoline continues to increase, alternative transportation becomes more important. Improved pedestrian and bicycle connectivity, coordinated traffic-signal timing, and reduced traffic congestion can help air quality, reduce energy use, and maintain individual health.

Recycling

The Economic and Ecological Impacts of Recycling in Montana (July 2004) report states "Throughout the United States, recycling has resulted in economic growth, net job increases, long-term investment, energy savings, waste reduction, lower production costs for many industries, and an extension of the life of landfills." This report states in 2003 the recycling industry had approximately 300 full-time jobs, paid an estimated $9,330,000 in wages and earned $89,120,000 in revenue. "The average wage (including benefits)… was calculated to be about $29,000. Total avoided landfill costs in 2002 as a result of recycling were estimated to be $4,615,776 for 128,216 tons recycled which avoided landfill at a fee of $36.00/ton."

Recycling is strongly supported by Helena residents as a way to divert waste from disposal to a useful economic resource with an environmental benefit. Recycling in the greater Helena area includes non-profit, private and government operations. The City transfer station currently accepts steel cans, aluminum cans, newspapers, magazines and corrugated cardboard, used motor oil, telephone books, and container glass for recycling.

The City's recycling program produces glass aggregate that can be processed locally and used for landscaping or fill material. Pavement millings (recycled asphalt) can be used for street overlays, parking lots, and fixing potholes.

Composting

Composting also provides an avenue to reduce Helena's waste stream while enriching the soil. The City has established a large composting area near the landfill. This compost is "recycled" around landscaped areas in the City's parks. The landfill's lifespan is extended by recycling the compost instead of putting this organic material in the landfill. Additional information about the City's recycling and composting programs is included in the **PUBLIC FACILITIES AND SERVICES** chapter of this document.

ENVIRONMENTAL ISSUES

In addressing climate change, the City should consider the recommendations included in the 2009 Helena Climate Change Action Plan, the most recent in-depth consideration of a variety of environmental issues as they relate to climate change. In addition to general climate change recommendations, the Action Plan also addresses waste management, transportation, public-private partnerships, and water supply, treatment, and recovery. All of the recommendations will have budget implications and would require a prioritization process. (See Appendix for a complete list of recommendations.)

The Growth Policy presents concepts that relate to Helena's environmental issues. The natural environment is deeply linked with economic development as an attraction to new and expanding businesses, a tourist destination, and a basic component of Helena's character and quality of life. It is a balancing act to maintain a healthy community in terms of air and water quality, provide adequate outdoor recreational opportunities, reduce energy use, minimize hazards, and co-exist with wildlife while supporting a viable local economy. Enhancing the natural environment and mitigating environmental impacts are important factors to consider with development, and significant natural features should be respected.

Adequate buffers should be incorporated or appropriate mitigation provided to minimize impacts to ground and surface waters, water bodies, drainages, floodplains, riparian areas, and wetlands. Additionally, slope cuts and fills resulting from road or building construction should be minimized to alleviate erosion, reduce stormwater drainage, reduce the spread of weeds, and minimize negative visual effects.

Urban densities and residential development within the city and in close proximity to employment and services can reduce vehicle miles traveled; decrease potential air pollution; produce more efficient use of land, infrastructure, and the transportation network; and reduce development pressures on sensitive areas and the natural environment. New development will occur in accordance with the latest edition of the International Energy Conservation Code as adopted by the State of Montana. Subdivisions should provide an efficient transportation system that accommodates future connectivity and non-motorized means of transportation to reduce emissions and maintain good air quality. The **LAND USE** component of this Growth Policy is critical to the success of a sustainable community.

Development within the City often requires compliance with more stringent environmental regulations to protect the natural environment, such as wastewater and stormwater quality standards, than may be applied to development occurring outside the municipality. However, the effect development has on the environment, such as air and water, is not limited to political boundaries. The City of Helena and Lewis and Clark County currently work cooperatively with the City-County Health Department, Water Quality Protection District, Lake Helena Watershed Group and the Tri-County Fire Safe Working Group. This environmental cooperation continues and in some instances, has been expanded to include the City of East Helena, Jefferson County, and Broadwater County.

GOALS AND OBJECTIVES

Goal:

Maintain and enhance a healthy, sustainable environment, respect significant natural features when development is permitted, and mitigate development's impacts with the City providing leadership in conservation and resource protection.

Objectives:

1. Maintain and buffer irreplaceable natural features such as wetlands, stream corridors, and similar high-value habitats that provide wildlife habitat and recreational, water quality, and safety values, such as flood control.

2. Preserve habitat identified as protected by the Endangered Species Act or as important to wildlife species identified by the State of Montana as species of conservation concern.

3. Minimize wildlife conflicts with new subdivisions.

4. Identify deer-resistant vegetation and drought-tolerant species and plant material that require minimal watering, incorporating a comprehensive public information program covering desirable landscape practices including green composting, xeriscaping, Integrated Pest Management (IPM) and adopt strategies for City activities that reflect best current practices in landscaping and pest management.

5. Protect the natural open spaces, skylines, and sightlines on the City's south border, evaluate subdivisions for objects of historic and aesthetic significance, and protect such features or mitigate their loss.

6. Develop and implement an overall formal management strategy that includes a prioritized urban forestry program.

7. Require subdivisions to provide an efficient transportation system that accommodates future connectivity and non-motorized transportation to maintain air quality by reducing dust, auto emissions and greenhouse gases.

8. Evaluate subdivision impacts to ground and surface waters, water bodies, drainages, floodplains, riparian areas, and wetlands, incorporating adequate buffers or requiring appropriate mitigation, including, but not limited to, stormwater treatment and discharges to improve the viability of wetlands.

9. Reduce demand on the water supply system and the gallons per capita per day demand, thereby reducing the need for infrastructure expansion by adopting a targeted multi-faceted community education and outreach water conservation program that may include incentives.

10. Pursue water supply/municipal watershed protection, especially the Ten Mile watershed as a key part of the municipal water supply, and restore those parts of the watershed that have been impaired by human activity.

11. Minimize environmental degradation in areas with challenging physical and environmental characteristics, such as steep slopes, wildland-urban interface, watercourses, drainage ways and wetlands, and minimize cut-and-fills on slopes resulting from road or building construction.

12. Prevent loss of life, property, and increased costs to the public from a Wildland-Urban Interface fire on public and private land located in and around Helena and maintain an effective emergency response and recovery system that ensures safe and orderly evacuation.

13. Promote energy efficiency and conservation with development standards, land use regulations, public/private partnerships and education, and consider the use of incentives where appropriate.

14. Establish a municipal greenhouse gas reduction goal and implement the recommendations of the *2009 Climate Change Action Plan*.

15. Eliminate financial disparities by providing recycling services to City residents and other participants in accordance with their financial support.

16. Require City operations or contracts to include weed-free materials and construction methods.